

WHAT WE CAN LEARN ABOUT THIN FILM MAGNETISM FROM OFF-SPECULAR SCATTERING.

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We shall discuss specular reflectivity and off-specular scattering of neutrons and X-rays from magnetic films. Both these techniques are capable of yielding information about the morphology of the chemical and magnetic roughness and the magnetic domain structure. The use of neutrons with polarization analysis enables the spatial distribution of different vector components of the magnetization to be determined, and the use of resonant magnetic X-ray scattering enables magnetization in a compound system to be determined element-selectively. Thus both these methods provide powerful and complementary new probes for studying magnetism at the nanoscopic level in a variety of systems such as those exhibiting exchange bias, giant magnetoresistance, spin injection, etc. We shall illustrate with an example of both techniques applied to an exchange bias system consisting of a single crystal of antiferromagnetic FeF_2 capped with a ferromagnetic Co film, and what has been learned about how exchange bias works in such a system.